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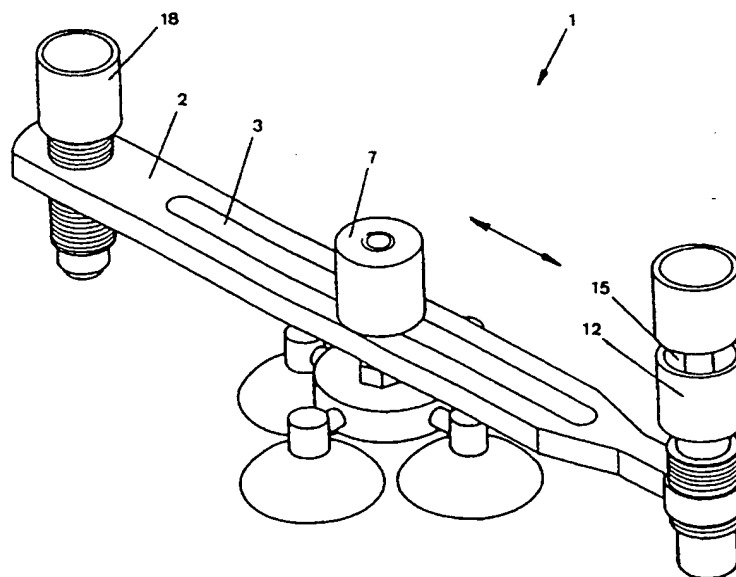
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For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: GLASS REPAIR APPARATUS



(57) Abstract: The invention provides for an apparatus (1) removably securable to glass for assisting with the repair of glass, the apparatus (1) including a bridge (2), a mounting means, and a bridge retaining and adjustment means, the bridge (2) being provided with a slot (3), the mounting means including at least one suction cup means, in use, being removably attachable to glass and being adapted to allow the bridge retaining and adjustment means to be mounted thereupon, the bridge retaining means having a means (7) to releasably secure the bridge (2) to the mounting means to allow the bridge (2) to be slidable between one end of the slot (3) to the other, the bridge (2) being adapted to retain a glass contact or repair means (12) adjacent the one end of the slot (3) and an adjustable glass pressure means (18) adjacent the other end of the slot (3). The invention also includes a method to use of the above apparatus (1).

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## GLASS REPAIR APPARATUS

## TECHNICAL FIELD


- 5 This invention relates to apparatus and methods for repairing cracks and chips in glass. More particularly, but not exclusively, this invention relates to the use of a bridge for retaining a resin injector device adjacent the area of glass being repaired.

## BACKGROUND ART

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- It is common for vehicle windscreens and related forms of glass to incur cracks and breaks from objects impacting with the outer surface or layer of the glass. A common form of impact is with stone chips on a road being thrown into the path of a travelling vehicle. In the case of vehicle windscreens or windshields, as the glass is generally laminated, a minor
- 15 impact can cause the outer layer to fracture in a variety of ways. The fracture may be star shaped, be a bull's eye break, or a more severe form of multiple fracture or shattering. Repair of the windscreen rather than replacement becomes an effective option when the damage is not severe enough to cause damage to the inner layer of the laminated glass. A repaired windscreen can be a more cost-effective option than replacing the windscreen and
- 20 may well also be less time consuming.

- To repair fractured glass to achieve a virtually transparent finish can be a difficult task. The task can involve the removal of air from the site and filling the site about the glass fracture with an appropriate clear or transparent resin or epoxy type chemical composition
- 25 to minimise the refraction of light through the fracture and to arrest any further damage to the fractured site.

- Many conventional vehicle windscreen repair devices are cumbersome and bulky to use. One reason may be because the apparatus used for repairing a fracture fixes the resin
- 30 applicator over the fracture site but does not allow free movement of the resin applicator
- 

without removing and repositioning the whole apparatus. Some devices allow some range of movement although in a few cases the resin injector can only move in a limited arc. Repositioning of a glass repair unit can increase the time required to repair a site and can cause a less than satisfactory result with the repair being undertaken. Repositioning of the  
5 device if suction cups are used increases the risk of flexing the glass and allowing air to

Some glass repair devices require use of bulky bridges that can be large in size and may block light and vision to the area being repaired. Some may also encroach on the area being repaired making it more difficult to apply appropriate pressure on the area to open  
10 cracks.

It is an object of the present invention to provide an apparatus for and a method of repairing glass which overcomes at least some of the abovementioned problems, or which provides the public with a useful choice.

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## SUMMARY OF THE INVENTION

According to a first broad aspect of the invention there is provided an apparatus removably securable to glass for assisting with the repair of glass, the apparatus  
20 including a bridge, a mounting means, and a bridge retaining and adjustment means, the bridge being provided with a slot, the mounting means including at least one suction cup means, in use, being removably attachable to glass and being adapted to allow the bridge retaining and adjustment means to be mounted thereupon, the bridge retaining means having a means to releasably secure the bridge to the mounting means to allow  
25 the bridge to be slidable between one end of the slot to the other, the bridge being adapted to retain a glass contact or repair means adjacent the one end of the slot and an adjustable glass pressure means adjacent the other end of the slot.

Preferably the bridge is elongate and the slot extends along substantially the length of  
30 the bridge.

Desirably the suction cup means is attached to a body portion, and the body portion is attached to the bridge adjustment means. Advantageously at least two or three suction cups are attached to the body portion.

- 5 Preferably the bridge is secured to the mounting means by a threaded elongate member passing through the slot, and wherein an adjustable knob is locatable above the bridge.

Preferably the invention further comprises the glass contact or repair means. Desirably the glass contact or repair means is a resin injector member. Alternatively the glass

- 10 contact or repair means is a probe.

Preferably the suction means is transparent. Desirably the adjustable glass pressure means is threaded to a corresponding thread within the bridge. Desirably the glass contact means is adapted to allow either or both a probe and/or a resin injector means

- 15 to be mounted to one end of the bridge.

Advantageously the bridge is made of a suitable durable and lightweight material. Desirably the bridge is made of aluminium

- 20 Alternatively the bridge is angled at the other end of the slot to retain two resin injector members.

According to a further broad aspect of the invention there is provided a method of repairing fractured glass using the apparatus of any one of the preceding claims, the

- 25 method comprising the steps of:

- a. mounting the suction cup means against the glass adjacent the area of glass to be repaired;
- b. placing the bridge over the bridge retaining and adjustment means;

- c. screwing the pressure adjusting knob until an appropriate pressure is applied to the resin injector means located at one end of the bridge; and
- d. moving the bridge along the slot while pressure is still being applied at the tip of the injector member to apply resin along a fractured glass site as required.

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## BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be illustrated, by way of example only,  
10 with reference to the accompanying drawings in which:

Figure 1: illustrates a perspective view of a glass repairing apparatus in accordance with a preferred embodiment of the invention;

15 Figure 2: illustrates a side view of figure 1;

Figure 3: illustrates a perspective view of a glass pressure apparatus in accordance with an alternative aspect of the invention;

20 Figure 4: illustrates a side view of figure 3; and

Figure 5: illustrates an alternative arrangement for resin injector members on a bridge.

## 25 DETAILED DESCRIPTION OF THE DRAWINGS

Referring to figures 1 and 2, a glass repair apparatus, generally referred to as 1, according to a preferred embodiment of the invention, is illustrated.

It will be appreciated that one application with the apparatus 1 is with repairing glass, and more particularly, but not necessarily exclusively, for repairing cracks and breaks in laminated glass. Laminated glass is commonly used in vehicle windscreens or windshields. For purposes of the following description when reference is made to using the invention  
5 for repairing windscreens it is considered that it is applicable to all forms of glass that can be repaired using commonly available resins for insertion into such cracks, fractures and breaks.

The apparatus 1 includes a bridge 2 having a slot 3 therein. The bridge 2 is preferably made  
10 of any suitable durable and resilient material and is preferably lightweight. The bridge is desirably made of a metal in the form of aluminium, cast iron or an alloy. The bridge 2 is desirably elongate and of a narrow profile to increase a repairer's vision of the area to be repaired.

15 The slot 3 allows for the bridge 2 to be slidable along the slot and/or rotate about a bridge retaining and adjustment means. This provides a high range of movement that is very desirable. The bridge retaining and pressure adjustment means is in the form of an elongate threaded rod 4 having a spacer in the form of a spacer nut 5 located on the lower portion of the threaded rod 4. This spacer 5 can be removed for repair jobs requiring the  
20 full length of rod 4 that may occur with curved glass.

The rod 4 is of a sufficient length to allow the bridge 2 to be placed thereon with the rod 4 passing through the slot 3. A pressure adjusting knob 7 with a corresponding internal thread to the rod 4 is provided to apply pressure to components on the bridge 2 and secure  
25 or restrain the bridge when tightened. Releasing the pressure on the knob 7 allows a user to slidably reposition the bridge 2 anywhere along the slot 2 as required during the repair process for fractured glass and then pressure is re applied to secure the bridge 2 in place. It will be appreciated by someone skilled in the art that all adjustments during use of the apparatus 1, including fine adjustments in pressure, may be achieved by adjusting the knob  
30 7.

The mounting means includes a base portion 8 to which the bridge retaining and adjustment means is attached. The rod 4 is desirably attachable to a base portion 8 by being screwed through a corresponding thread located in a hole (not shown) in the base portion 8. Suction cups 10 are attached to the base portion 8 via legs 11 and arranged in a suitable configuration for proper stability of the base portion 8.

In an alternative embodiment of the invention the nut 6 is replaced by a base portion 8 having an integrated sleeve or spacer extending toward the bridge as if the nut 6 and base portion 8 are one moulded base unit. An adequate length of rod 4 between the bridge and the moulded base unit will allow a full range of movement and pressure to be applied by the knob 7 on the bridge 2.

In this embodiment four suction cups are used. It will be appreciated according to other aspects of the invention that one suction cup may be configured and arranged to attach directly to the rod 4 or that in the embodiments having a base portion, at least one suction cups may be used.

The suction cups are composed of a suitable material for suction purposes to glass and preferably be clear or transparent to allow a user to have a greater view of the area of glass to be repaired. Transparent suction cups 10 do not form shadows or block out light to the area being repaired to the extent of dark coloured suction cups.

At one end of the bridge 2 is a glass contact means in the form of a probe and/or a resin injector member 12. In this embodiment a resin injector member 12 is shown. It will be appreciated that in alternative embodiments, as in figures 3 to 4, a probe may be attached to the one end of the bridge or both a probe and a resin injector member 12 may be attached. It is envisaged within the scope of the invention that the probe, particularly when in combination with a resin injector member, may be configured and arranged to be separately adjustable with height to allow for variations in the contours of a windscreen or other such glass.

The resin injector member 12 is preferably provided with a long threaded outer section 13 to correspond with a threaded section 14 located in an aperture in the bridge 2. The circular threaded section 14 in many bridges would be half an inch in diameter. This  
5 allows the injector member 12 to be adjusted in height relative to the glass surface (not shown) when the apparatus 1 is being set into position adjacent the glass to be repaired. The injector member 12 has a cavity or chamber 15 within and each end of the chamber is open. The top end of the chamber 15 is adapted to allow a resin piston or plunger 17, in use, to be inserted therein to plunge resin placed in the chamber 15 under pressure into the  
10 area to be repaired. The plunger 17 may be plunged by screwing action or otherwise.

An adjustable glass pressure member 18 is locatable adjacent the other end of the bridge 2. The adjustable glass pressure member 18 is desirably elongate and preferably has a threaded outer section 19 to correspond with a threaded section located in an aperture 20 in the  
15 bridge 2. When the apparatus 1 is being set into position on glass, the glass pressure member 12 can be screwed to apply pressure against the glass (not shown) to tilt the bridge 2 and lower the other end of the bridge 2 toward the glass such that the injector member 12 applies pressure to the glass.

20 Referring now to figures 3 & 4, an apparatus for applying pressure to glass, generally referred to as 50, according to an alternative embodiment of the invention, is illustrated.

The apparatus 50 includes a bridge 51 having a slot 52 therein. The bridge 51 is preferably made of any suitable durable and resilient material and is preferably lightweight. The  
25 bridge 51 is desirably made of the same material as in bridge 2 of figures 1 & 2.

The slot 52 allows for the bridge 51 to be slidable along the slot about a bridge retaining and adjustment means. The bridge retaining and adjustment means as described with reference to figures 1 & 2 is incorporated in this description for figures 3 & 4 and will not  
30 be repeated.



At one end of the bridge 51 is a glass contact means in the form of a probe 53. The probe 53 is attached to the bridge 51 and is of a sufficient length such that the tip 54 of the probe can be adjusted by the bridge adjustment means to press against and apply pressure to the glass being repaired.

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An adjustable glass pressure member 55 is locatable adjacent the other end of the bridge 51. The adjustable glass pressure member 55 is desirably elongate and preferably has a threaded outer section 56 to correspond with a threaded section located in an aperture 57 in the bridge 51. When the apparatus 1 is being set into position on glass, the glass pressure  
10 member 55 can be screwed further through the aperture 57 to apply pressure against the glass (not shown). The pressure knob (as numeral 7 in figures 1 and 2) is then operated to set and adjust the required pressure.

Referring now to figure 5, an end view of twin resin injector members locatable on an  
15 angled bridge, is illustrated.

It is envisaged in some applications that two of the apparatus 1 can be used for side by side use of the resin injectors. This arrangement may be suitable for repairing multiple cracks or fractures, and when such cracks or holes are in close proximity.

20

The bridge 60 is angled at the resin injector member end to retain two resin injector members 61, 62 with respective plungers 65, 66 instead of the usual one. The apertures 63, 64 are threaded to corresponding thread on the outside of the injector members 61, 62.

25 This arrangement allows twice the amount of resin to be injected into the fractured area or to inject resin in twin cracks.

The angled section on the bridge 60 may be aligned so that instead of both injector members 61, 62 being tilted only one injector member is tilted and the other may be  
30 perpendicular to the glass surface.

- Referring now to figures 1 to 4, in operation, and when a fracture in glass is to be repaired, the apparatus 1 is mounted by the suction cups 10 being pressed against an appropriate position adjacent the fracture on the glass (not shown) until air has been expelled and sufficient suction retains the mounting means to the glass. The bridge 2 is then placed over the rod 4 through the slot 3 and the pressure adjusting knob 7 is screwed on the end of the rod 4 to retain and secure the bridge 2 in the required position. At this point the bridge 2 may be substantially parallel with the glass if the glass is flat.
- 10 The resin injector member 12 is screwed until it touches the glass. The bridge 2 could be adjusted to remain substantially parallel in the case of flat glass. If the glass is curved, the spacer nut 5 may have to be lowered to lower the bridge 2 evenly further toward the glass until the injector member 12 and the pressure member 17 touches the glass.
- 15 The apparatus 50 may also be used during the repair process to open the damaged area sufficiently to allow resin to be inserted in the fractured area. In this case a similar method of mounting the apparatus 50 may be applied as for apparatus 1. That is, the apparatus 50 is mounted by the suction cups being pressed against an appropriate position adjacent the fracture on the glass (not shown) until air has been expelled and sufficient suction retains the mounting means to the glass. The bridge 51 is then placed over the rod through the slot 52 and the locking nut screwed on the end of the rod to retain and secure the bridge 51 in the required position which is with the probe tip 54 touching the desired glass fracture area.
- 20 The pressure member 55 is then screwed until it meets the glass and the bridge 51 should be substantially parallel with the glass if the glass is flat. The probe tip 54 should be touching the glass. Further pressure can then be applied by adjusting the pressure member 55 or more commonly to tighten the knob 7.

It will be appreciated that the knob 7 can be unscrewed and the bridges 2 and/or 51 moved during the repair process without having to reposition the suction cups of the mounting means. This is useful when fractures comprise a number of legs in say, a star fracture, and the resin injector member 12 has to be moved, and the probe used in a different area of the star fracture. In many repairs the resin injector member 12 remains adjacent one end of the crack and forces resin under pressure to flow out the other end of the crack.

The bridges 2 and 51 are desirably long and thus allow for a greater range of movement, which is particularly useful for long cracks.

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The apparatus 1 and the apparatus 50 are designed to be easy to mount and set up, and be easily managed during the repair process. The apparatus 1 and apparatus 50 comprise similar components with interchangeable elements.

15 A further advantage with this invention is that the apparatus 1 and apparatus 50 allow for fine adjustments of pressure to be applied to the fracture area and thus an efficient and effective glass repair process can be facilitated.

The apparatus 1 & 50 of the invention are lightweight and not bulky and therefore are easily portable.

It will be appreciated by someone skilled in the art as to how to apply resin properly to a fractured glass area using common methods of applying pressure and with commonly available resins for such purposes. The resin injector member 12 is commonly available and may be purchased separately and be located in the bridge 2 section of the apparatus 1, or the apparatus 1 may be packaged for sale with a standard resin injector member 12. Those methods do not involve the new process step, *inter alia*, of a slidable bride 2 that is considered one of the advantages over the prior art with the apparatus 1 of the invention.

Wherein the foregoing reference has been made to integers or components having known equivalents, then such equivalents are herein incorporated as if individually set forth. Accordingly, it will be appreciated that changes may be made to the above described embodiments of the invention without departing from the principles taught herein.

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Additional advantages of the present invention will become apparent for those skilled in the art after considering the principles in particular form as discussed and illustrated. Thus, it will be understood that the invention is not limited to the particular embodiments described or illustrated, but is intended to cover all alterations or modifications which are

10 within the scope of the appended claims.

## What I Claim is:

1. An apparatus removably securable to glass for assisting with the repair of glass,  
the apparatus including a bridge, a mounting means, and a bridge retaining and  
adjustment means, the bridge being provided with a slot, the mounting means  
including at least one suction cup means, in use, being removably attachable to  
glass and being adapted to allow the bridge retaining and adjustment means to be  
mounted thereupon, the bridge retaining means having a means to releasably  
secure the bridge to the mounting means to allow the bridge to be slidable  
between one end of the slot to the other, the bridge being adapted to retain a  
glass contact or repair means adjacent the one end of the slot and an adjustable  
glass pressure means adjacent the other end of the slot.
2. An apparatus according to claim 1 wherein the bridge is elongate and the slot  
extends along substantially the length of the bridge.
3. An apparatus according to claim 1 wherein the suction cup means is attached to a  
body portion, and the body portion is attached to the bridge adjustment means.
4. An apparatus according to claim 3 wherein at least three suction cups are  
attached to the body portion.
5. An apparatus according to claim 1 wherein the bridge is secured to the mounting  
means by a threaded elongate member passing through the slot, and wherein an  
adjustable knob is locatable above the bridge.
6. An apparatus according to claim 1 further comprising the glass contact or repair  
means.

7. An apparatus according to claim 6 wherein the glass contact or repair means is a resin injector member.
8. An apparatus according to claim 1 wherein the glass contact or repair means is a probe.
9. An apparatus according to any one of the preceding claims wherein the suction means is transparent.
10. An apparatus according to claim 1 wherein the adjustable glass pressure means is threaded to a corresponding thread within the bridge.
11. An apparatus according to claim 1 wherein the glass contact means is adapted to allow either or both a probe and/or a resin injector means to be mounted to one end of the bridge.
12. An apparatus according to claim 1 wherein the bridge is made of a suitable durable and lightweight material.
13. An apparatus according to claim 7 wherein the bridge is angled at the other end of the slot to retain two resin injector members.
14. An apparatus according to claim 11 wherein the bridge is made of aluminium.
15. A method of repairing fractured glass using the apparatus of any one of the preceding claims, the method comprising the steps of:
- e. mounting the suction cup means against the glass adjacent the area of glass to be repaired;
  - f. placing the bridge over the bridge retaining and adjustment means;

- g. screwing the pressure adjusting knob until an appropriate pressure is applied to the resin injector means located at one end of the bridge; and
- h. moving the bridge along the slot while pressure is still being applied at the tip of the injector member to apply resin along a fractured glass site as required.

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16. An apparatus substantially as herein described with reference to any one of the accompanying drawings.

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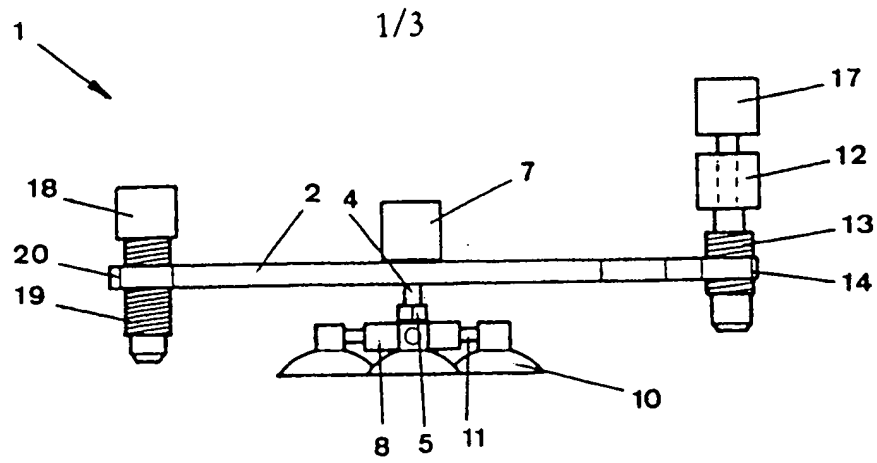


Figure 2

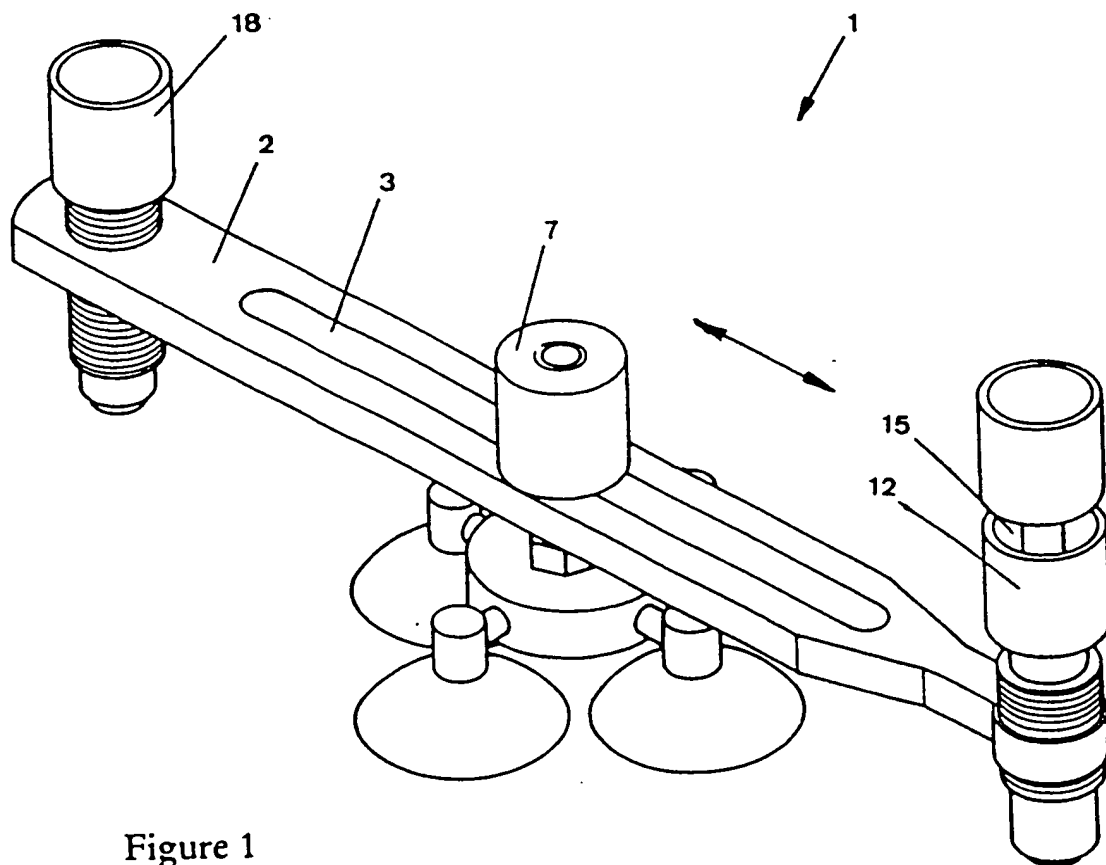


Figure 1



2/3

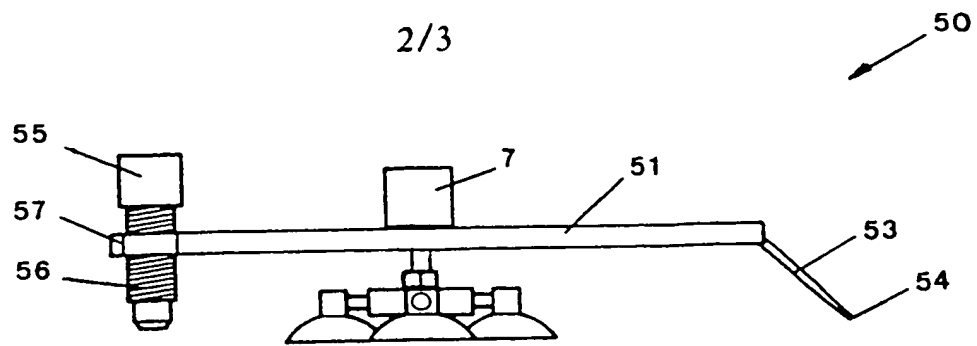


Figure 4

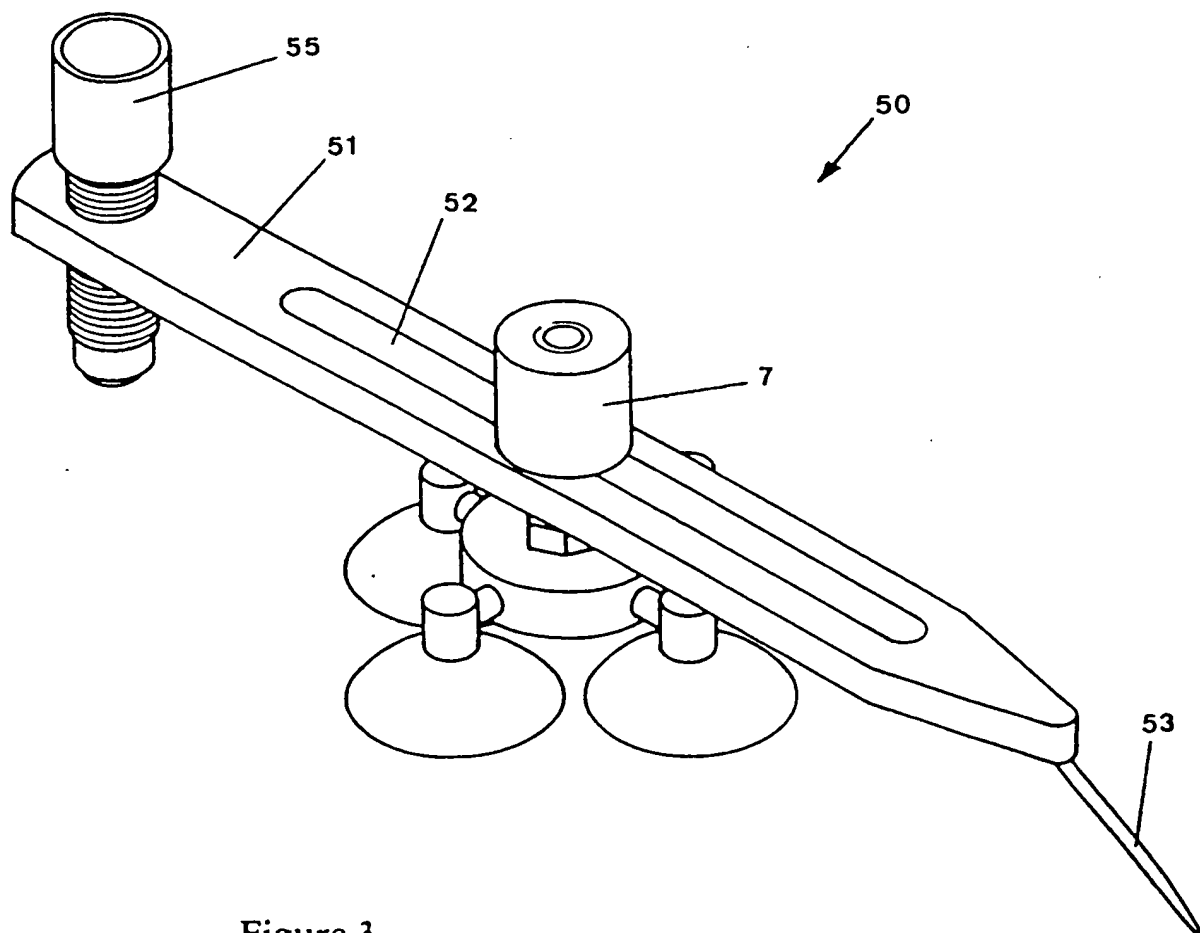


Figure 3

3/3

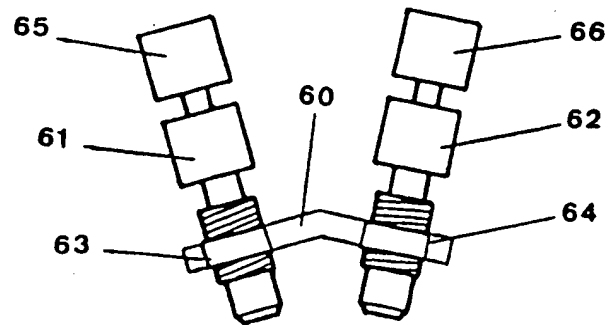


Figure 5

## INTERNATIONAL SEARCH REPORT

International application No.

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## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. B32B 35/00, B29C 73/02, B60J 1/00, B60S 5/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B32B 35/00, B29C 73/02, B60J 1/00, B60S 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI: windscreen etc and repair etc and suction etc

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4681520 A (BIRKHAUSER) 21 July 1987 Figs.	1-16
X	US 5626261 A (WANSTRATH) 6 May 1997 Fig 7	1-16
X	US 5234325 A (HILL) 10 August 1993 Figs.	1-16

☒ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

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Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer  PETER WARD Telephone No : (02) 6283 2129

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00021

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5104304 A (DOTSON) 14 April 1992 Figs.	1-16
X	Derwent Abstract Accession No. 98-292367/26 Class G03 L01 JP 10102009 A (MATIO CORP YG) 21 April 1998 Abstract	1-16
A	US 5425827 A (CAMPFIELD) 20 June 1995 Figs.	1-16

INTERNATIONAL SEARCH REPORT  
Information on patent family members

international application No.  
PCT/NZ01/00021

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member				
US	4681520	AU	24703/84	CA	1235559	EP	117697
		JP	59183858	ZA	8401248	US	4597727
US	5626261	NONE					
US	5234325	NONE					
US	5104304	NONE					
US	5425827	AU	89354/91	CA	2091340	US	5116441
		WO	9204173	US	5429692	US	5512116
		US	5589018	US	5614046	US	6033507
		AU	10906/95	AU	97033/98	BR	9408103
		CA	2176593	EP	729410	EP	1033233
		WO	9513922	NZ	276595	AU	74394/94
		EP	659391	US	5477761		
END OF ANNEX							